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R&D MANAGEMENT

Cultural prerequisites for participating in open foresight

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Companies are increasingly interested in participating in open foresight. However, little is known about the conditions supporting them to open up successfully in open foresight. This research takes a culture perspective on this issue. The leading assumption is that companies with an open culture are more likely to engage in collaboration than companies with a culture inhibiting openness. We use the Competing Values Framework to measure corporate culture, and collaboration breadth and depth to measure openness to external collaboration. Drawing on a sample of 168 Austrian companies, the research confirms that culture plays an important role in creating an environment supportive of open foresight, albeit in a somewhat surprising way: the internally oriented clan culture appears to support openness, while the externally oriented market culture does not support it. Possible explanations for this finding are put forward as directions for further research. The findings should help companies to predict whether they have the cultural conditions in place to embark on an open foresight journey successfully.

1. Introduction

Companies cannot master the increasing complexity and dynamics of their business environments (Vecchiato and Roveda, 2010; Fjeldstad et al., 2012) by relying exclusively on internal capabilities. It pushes them to collaborate with other companies through strategic alliances and partnerships (Enkel et al., 2009; Bogers and West, 2012), and activities such as open innovation (e.g. Chesbrough, 2003; Chesbrough and Crowther, 2006; Vanhaverbeke and Cloodt, 2006). This paper focuses on open foresight, a recent and increasingly important development (e.g. Daheim and Uerz, 2008; Mietzner and Reger, 2009; Heger and Boman, 2015; Wiener, 2018).

In open foresight, companies jointly look into the future, and exchange know-how in order to create added value (Daheim and Uerz, 2008). However, collaboration is not a trivial task (Chaudhuri and Boer, 2016; Hu et al., 2017). It requires companies to adapt (Heger, 2014) and develop an adequate organizational design to capture the gains of open initiatives (Fjeldstad et al., 2012; Appleyard and Chesbrough, 2017). As open foresight is so new, various scholars (e.g. Heger, 2014; Van der Duin et al., 2014; Heger and Boman, 2015) have proposed to build on adjacent areas as a foundation to study the phenomenon. We follow this suggestion and use open innovation and collaboration theory to develop open foresight theory.

Various factors affecting the likelihood of success of open innovation have been proposed, including

absorptive capacity (Enkel et al., 2011; West and Bogers, 2013), stakeholder integration (Cuhls et al., 2009) and, particularly, culture (e.g. Chesbrough, 2003; Docherty, 2006; Laursen and Salter, 2006; Gassmann et al., 2010; Herzog and Leker, 2010; Mortara et al., 2010; Enkel et al., 2011; Ollila and Elmquist, 2011; West and Bogers, 2013; Naqshbandi et al., 2015). However, detailed insight into the cultural settings supporting open innovation (Gassmann et al., 2010; Mortara et al., 2010; Brettel and Cleven, 2011; Szymańska, 2016) and, for that matter, foresight (Wiener, 2018; Wiener et al., 2018b) is lacking. This paper intends to address this gap and show how culture fosters or inhibits a company's openness to open foresight.

The next section explores the literature on organizational culture, openness and open foresight, and develops the hypotheses that drive the research. Then, the research design is accounted for. Subsequently, the analytical results are reported and, then, discussed. The paper is concluded with a summary of its contribution to open foresight theory and practice, a discussion of the limitations of the study, and suggestions for further research based on that.

2. Theoretical background

2.1. Open foresight

Corporate (e.g. Daheim and Uerz, 2008; Von der Gracht et al., 2010) or strategic foresight (e.g. Mietzner and Reger, 2009; Rohrbeck et al., 2009; Vecchiato and Roveda, 2010) is the process of '*identifying, observing and interpreting factors that induce change, determining possible organization-specific implications, and triggering appropriate organizational responses*' (Rohrbeck et al., 2015, p. 2).

In response to the increasing complexity and dynamics of their business environments, companies have started opening up their foresight activities (Daheim and Uerz, 2008; Van der Duin et al., 2014; Gattringer et al., 2017; Wiener, 2018; Wiener et al., 2018b).

Daheim and Uerz (2008, p. 332) describe open foresight as '… *anticipating through an open dialogue the dynamic interaction between social, technological and economic forces*'. Gattringer et al. (2017, p. 300) provide a slightly more detailed definition: '… *a discussion and analysis process of a few organizations concerning future developments … which are relevant for the participating organizations and wherein issues related to future individual strategy and innovation options are collectively considered*'.

Research reports on open foresight are few and scattered. Some authors focus on foresight methods and approaches (Daheim and Uerz, 2008; Schatzmann et al., 2013; Rau et al., 2014). Other authors study the role of factors such as:

- The partners' resource and asset bases, their aspirations for and commitment to the network, and their absorptive capacity and relational capabilities (Heger, 2014).
- Technological diversity, geographical proximity, trust, and commitment (Gattringer et al., 2017).
- Size (Heger and Boman, 2015), company role in, and type and organizational scope of, the foresight activities (Van der Duin et al., 2014).
- Corporate culture (Wiener et al., 2018b) and top management commitment and foresight team heterogeneity (Wiener, 2018).

Paliokaitė (2010) and Heger (2014) are conceptual contributions. All other publications are case study-based. Overall, open foresight theory development is in its very early stages. Based on a larger scale, survey design, this paper investigates the role of culture.

2.2. Organizational culture

Most authors agree that culture represents the values, norms, artifacts, and underlying assumptions that are shared by a group of people (e.g. Schein, 1992). In the literature, several different culture models have been proposed. As the unit of analysis is the individual company, national-level models (e.g. Hofstede, 1980, 1991; Trompenaars and Hampden-Turner, 1997) are not considered here. Company-level culture models include the organizational culture profile (OCP) (O'Reilly et al., 1991), which enables assessing the fit between the characteristics of a company's employees and its organizational culture. This model has been used in studies of, among others, employee turnover/retention, knowledge sharing, IT implementation, and innovation climate development. The personal, customer orientation, organizational and cultural issues (PCOC) model (Maull et al., 2001) is a cultural assessment tool to be used before implementing quality management and other major organizational changes. Igo and Skitmore (2006, p. 125) list several other '*assessment tools and methods*'. Finally, various authors develop their own framework (e.g. Tsui et al., 2006; Mortara et al., 2010) assembled from existing and/or new scales.

Many authors who mention the OCP, the PCOC, or another model do so in passing and actually use the competing values framework (CVF), first proposed by Quinn and Rohrbaugh (1981), in their research. The CVF distinguishes four cultural profiles, each with their own dominant orientation, value drivers, leader type, and effectiveness theory (Figure 1). The model has been operationalized in the Organizational Culture Assessment Instrument (OCAI) (Cameron and Quinn, 2006). We use this approach in this paper for two main reasons. First, we do not study major organizational change (the realm of PCOC) or employee–organization fit (the focus of OCP). Rather, we are interested in companies opening up for collaboration with other companies in response to increasing environmental complexity and dynamics, which reflect the underlying dimensions of the CVF. Second, as the CVF and the OCAI are the widest used and validated frameworks, we anticipate that using these approaches toward measuring culture increases the replicability of our study.

The theory behind the flexibility and externally oriented adhocracy culture is that innovativeness, vision and constant change produce effectiveness. The clan culture is located along the internal and flexibility dimensions. The main credo of companies characterized by this culture is that a focus on human development, cohesion, and high commitment produce effectiveness. The externally and control-oriented market culture assumes that competing aggressively and customer focus produce effectiveness. The hierarchy culture has an internal and control focus and pursues effectiveness through control and efficiency, standardized rules and procedures, and well-defined responsibilities.

2.3. *Organizational culture, open innovation, and open foresight*

Open innovation scholars argue that an advantageous organizational culture promotes open innovation (e.g. Chesbrough, 2003; Docherty, 2006; Laursen and Salter, 2006; Gassmann et al., 2010; Herzog and Leker, 2010; Mortara et al., 2010; Enkel et al., 2011; Ollila and Elmquist, 2011; West and Bogers, 2013; Naqshbandi et al., 2015). '*Innovating in an open system requires a different way of thinking …* [and different] *norms, beliefs and values*' (Van der Meer, 2007, pp. 195, 196), which give '*employees the necessary flexibility, spontaneity, and responsibility to develop inter-organizational relationships*' (Ritter and Gemünden, 2003, p. 750). Or, as Szymańska (2016, p. 143) puts it, '*the successful introduction of open innovation into … enterprises is inextricably linked with their organizational culture. Thus, the formation of … the so-called open organizational culture, is crucial*'.

The question is: does culture also affect open foresight and, then, how? A cursory Google Scholar

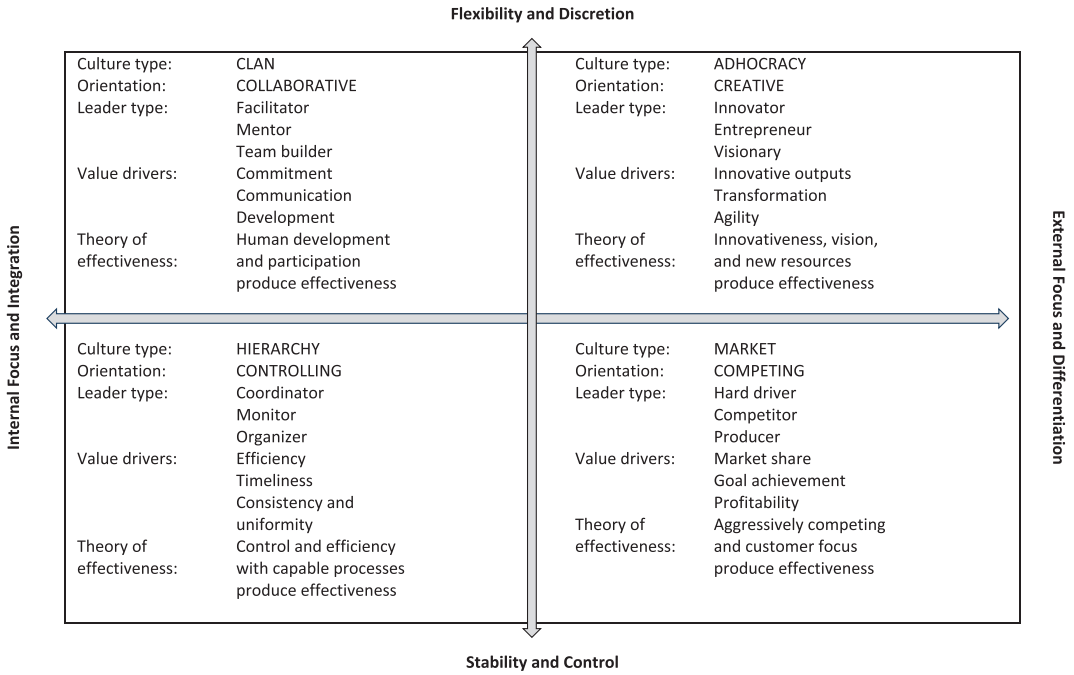

Figure 1. Characteristics of the clan, adhocracy market, and hierarchies (source: Cameron and Quinn, 2006). [Colour figure can be viewed at wileyonlinelibrary.com]

search with the search terms 'open foresight' AND ('organizational culture' OR 'corporate culture') conducted in April 2018 produced eight hits – three papers (including two from the same author) are about (strategic) foresight and advocate the future importance of open foresight (Jenssen, 2006, 2007; Rohrbeck et al., 2009); one EU project deliverable (Kamtsiou, 2009) mentions open foresight in passing; one working paper presents a research agenda (Paliokaitė, 2010) and mentions open foresight once, in a reference; and another working paper about early awareness, which mentions the term open foresight only once (Nick and Steger, 2006). Wiener et al. (2018b) report that flexibility-oriented values foster participation in open foresight. Wiener (2018) finds strong associations between culture and foresight processes. Both these papers are based on two case studies.

Thus, little is known about the association between culture and open foresight. An important question is: do we need to research that association at all? That is, does not open innovation theory inform open foresight theory sufficiently? Two considerations are in place. First, open foresight is not open innovation. Some authors position (open) foresight as part of the fuzzy front-end of (open) innovation (e.g. Wiener et al., 2018b). Other authors regard (networked or open) foresight and (open) innovation as distinctively different processes (e.g. Von der Gracht et al., 2010; Calof et al., 2018). Second, although an open culture is often mentioned as a necessity for open innovation and inter-organizational collaboration in general, surprisingly few papers report rigorous research-based results. Thus, we do not know if, to what extent and how open innovation theory actually informs open foresight theory.

These publications fall into two broad groups (Table 1).

One group of authors implicitly or explicitly use the key *dimensions* of the CVF culture profiles: control versus flexibility and internal versus external focus. Chesbrough (2003), Laursen and Salter (2006) and Ollila and Elmquist (2011) point out the importance of externally and flexibility-oriented or entrepreneurial values for open innovation, reasoning that companies need to handle divergent goals in collaborative settings. Docherty's (2006, p. 15) observations that an '*innovative culture*', which is created '*through continued exposure and relationships with external innovators*' (p. 14), '*support[s] strategic experimentation and reward[s] collaborative results*' (p. 15), point into the same direction, the importance of an external and flexibility orientation. These dimensions, which describe the adhocracy culture, support the detection of information about the (technological) frontier and sharing of technological competences with external parties; foster openness to, and inspire the creation of, ideas; help identifying opportunities and exploring external resources; encourage risk-taking and tolerance of failures; and prevent the not-invented-here syndrome (Herzog and Leker, 2010; West and Bogers, 2013).

Chesbrough (2003) is the only one in this group who also addresses the (negative) influence of a combined internal and control orientation, i.e. the dimensions of the hierarchy culture. None of the publications in this group point directly toward the role and effects of the two other culture profiles. With the exception of Laursen and Salter (2006), all publications are based on qualitative research.

The second group of authors study the association between the CVF culture *types*, or a similar classification, and open innovation, knowledge sharing or collaboration. Eckenhofer and Ershova (2011) show that the clan culture provides most support for opening up for collaboration, the hierarchy culture has the weakest effect; the position of the adhocracy and the market culture remains unclear. Wiewiora et al. (2013) report that the market culture has a negative impact, while clan values lead to positive knowledge sharing outcomes. The influence of the two other culture profiles is not clear. Naqshbandi et al. (2015) identify organizational culture types that enable open innovation activities. Using Tsui et al.'s (2006) scales, they distinguish between integrative, i.e. clan and hierarchy cultures. They show that an integrative culture supports in-bound open innovation, while a hierarchy culture retards both inbound and outbound open innovation. Klimas (2016) studies openness to coopetition, i.e. collaboration with competitors. She had '… *assumed* [the] *adhocracy and clan cultures to be most suitable for coopetition*' (p. 99), but finds '*… the hierarchy model as the most common and the most nearing to organizational cultures of coopetitor*s' … while the '*adhocracy model … appears as the least typical for coopetitors*' (p. 97).

Naqshbandi et al. (2015) do a survey study, the others case studies. The findings reported in this group are inconclusive and even conflicting. According to Eckenhofer and Ershova (2011) and Naqshbandi et al. (2015), the clan culture has the strongest impact; the hierarchy culture provides the lowest support (Eckenhofer and Ershova, 2011) or even retards (Naqshbandi et al., 2015) open initiatives. Wiewiora et al. (2013) support the role of the clan culture, cannot report anything about the hierarchy culture, which they did not find in their case studies, but find a negative impact of the market culture. Klimas (2016) goes against these findings and

Table 1. Reported relationships between cultural traits and profiles, and openness, collaboration and/or innovation

Author(s)	Topic	Internal orientation	External orientation	Control-orientation	Flexibility orientation	Adhocracy	Clan	Market	Hierarchy	Method[1]
Chesbrough (2003)	Open innovation	–	+	–	+					Case study
Docherty (2006)	Open innovation		+		+					Case study
Laursen and Salter (2006)	Open innovation		+		+					Survey
Ollila and Elmquist (2011)	Open innovation		+		+					Case study
Eckenhofer and Ershova (2011)[2]	Intra-organizational networks					2/3	1	2/3	4	Case study
Wiewiora et al. (2013)	Knowledge sharing					?	+	–	?	Case study
Naqshbandi et al. (2015)[3]	Open innovation						+		–	Survey
Klimas (2016)	Coopetition					4	3	2	1	Case study

+ Positive association with openness, collaboration, and/or innovation.
– Negative association with openness, collaboration, and/or innovation.
1 … 4 1 = strongest association with openness/innovation … 4 = weakest association with openness/innovation.
[1]The case study method includes industrial, possibly experience-based, examples as well as rigorously designed single or multiple case studies. The survey method includes postal and web-based questionnaires.
[2]These authors report that the clan culture has the strongest effect on intra-organizational network development, the hierarchy culture has the weakest influence. The adhocracy and market cultures lie in between, but their position relative to each other is not clear.
[3]These authors use the terms 'integrative culture', which is characterized by high internal integration and high external adaptation and, thus, reflects Cameron and Quinn's (2006) clan culture, and 'hierarchy culture', which scores low on these values and, thus, indeed reflects Cameron and Quinn's (2006) hierarchy culture.

reports that the hierarchy culture has the strongest effect, while the adhocracy has the weakest impact, on coopetition.

3. Hypothesis development

In summary, none of the authors in the second group find the adhocracy culture to play a dominant role, while all the authors in the first group point toward a key role for that culture. However, except for Klimas (2016), all other authors, agree that flexibility has a positive effect on openness, whereas control has a negative effect. Furthermore, most authors agree that an external orientation has a positive effect, in contrast to an internal orientation. Taken these notions to open foresight, we hypothesize:

H1: *Engagement in open foresight is positively related with the presence of an organizational culture strongly characterized by adhocracy, i.e. external and flexible, values.*

As the clan and market culture are characterized by a flexibility but internal, and an external but control orientation, respectively, we hypothesize that the relationship between open foresight and the clan and market culture, respectively, is positive but weaker than that for the adhocracy culture:

H2: *Engagement in open foresight is positively related with the presence of a culture strongly characterized by clan, i.e. flexible but internal, values, but the relationship with open foresight is weaker than that of the adhocracy profile.*

H3: *Engagement in open foresight is positively related with the presence of a culture strongly characterized by market, i.e. external but control, values, but the relationship with open foresight is weaker than that of the adhocracy profile.*

Finally, as the hierarchy culture is both internally and control-oriented, we hypothesize:

H4: *Engagement in open foresight is negatively related with the presence of a culture strongly characterized by hierarchy, i.e. internal and control, values.*

4. Methodology

4.1. Data collection and sample

The hypotheses were tested using survey data collected in 2016 in Austria. Contact details, annual sales, number of employees, and operating sector of the largest Austrian companies, measured by sales, was drawn from the 'CMDcomplete' database (https://www.cmd-complete.at/). The top 200 companies were contacted by phone in order to inform them about the study, retrieve the CEO's e-mail address, and ask for permission to send her/him the survey questionnaire. Thirty-two companies rejected to participate straight away. Calling companies ranked close to the top 200 continued until a total of 200 contact details was achieved. The link to the online questionnaire was mailed to these companies. The questionnaire was sent to another 1,800 companies by 'cold calling'.

Most responses were completed by the Managing Director, the Chief Financial Officer, the Strategy Manager, or the R&D Manager. The respondents were promised complete confidentiality. In order to motivate the addressees to participate, they could order a project report of the survey. The response rate was 10.04% (n=208). After elimination of 40 incomplete responses, a sample of 168 companies remained for analysis in this paper.

4.2. Descriptive results

Table 2 provides an overview of the actual and expected distribution of 16 industry sectors represented in the sample. Most service sectors are underrepresented. In contrast, the manufacturing sector (C) not only yielded a response rate of 45.2%, the largest in the sample, but also overrepresents the sector. This reflects Tyssen's (2012) finding that manufacturing companies are particularly interested in foresight. Overall, however, the actual distribution in the sample does not differ too much from the expected distribution.

4.3. Measures

We used the OCAI (Cameron and Quinn, 2006) to operationalize the CVF. The OCAI investigates six key characteristics: Dominant Characteristics, Organizational Leadership, Management of Employees, Organizational Glue, Strategic Emphasis, and Criteria of Success. We used the ipsative scale version of the instrument, which requests the respondents to allocate 100 points among four alternatives, each of which represents one of the four CVF cultures. Quinn and Spreitzer (1991) confirmed the validity and the reliability of the instrument. Because of the national language of Austria, the German version of the OCAI was applied, using Strack's (2012) translation and validation of four of the six dimensions of the OCAI. The remaining two dimensions were translated into German by the one of the authors of

Table 2. Sample classification by economic activities ($N = 168$)

	Classification	Actual distribution of industry sectors (%)	Expected distribution of industry sectors (%)
A	Agriculture, forestry, and fishing	0.0	0.1
B	Mining and quarrying	0.0	0.7
C	Manufacturing	45.2	34.4
D	Electricity, gas, steam, and air conditioning supply	0.6	1.1
E	Water supply, sewerage, waste management, and remediation activities	1.8	1.1
F	Construction	6.0	9.2
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	14.3	18.4
H	Transportation and storage	4.8	4.5
I	Accommodation and food service activities	1.2	1.9
J	Information and communication	5.4	6.7
K	Financial and insurance activities	5.4	4.4
L	Real estate activities	2.4	2.4
M	Professional, scientific, and technical activities	8.9	9.7
N	Administrative and support service activities	2.4	4.4
R	Arts, entertainment, and recreation	0.6	0.2
S	Other service activities	1.2	0.7
		100.0	100.0

Chi-square goodness-of-fit-test: $\chi^2 = 20.999$, $df = 15$, $p = 0.137$.

this paper and her colleagues; afterward, a native speaker did a back translation and compared it to the original version (Haas, 2009).

In addition, two questions measuring participation in open foresight were included. First, the respondents were asked to indicate whether they had collaborated with external partners in previous foresight activities. Companies that had collaborated were labeled OF (Open Foresight); companies that had not were labeled No OF (No Open Foresight). The OF respondents were presented with a list of nine partner types to measure collaboration breadth and depth. Collaboration breadth (breadthcollab) measures the *number* of collaborative partner types. Nine different partners were distinguished:

- Eight types from Laursen and Salter (2006): suppliers, clients or customers, competitors, consultants, commercial laboratories/R&D enterprises, universities and other higher education institutes, government research organizations, and private research institutes;
- One type from Gattringer et al. (2017): companies from other sectors.

For No OF companies, i.e. companies that had not collaborated with any of the partner types, breadthcollab was coded 0 (zero); for OF companies, breadthcollab was coded 1 (one). Collaboration depth (depthcollab) measures the *degree* to which an external partner is involved. The respondents could choose between no, low, medium, and high degree of involvement. If a company uses one or more of the external sources to a high degree, depthcollab was coded 1 (one); if the degree of collaboration with all partner types is low or medium, depthcollab was coded 0 (zero).

4.4. Statistical analysis

Table 3 shows that companies characterized by an adhocracy culture exhibit the highest level of both

Table 3. Breadth and depth by dominant culture

Dominant culture $N = 168$	No. of companies dominated by the culture	Mean ($N = 168$)	Maximum value	Minimum value	Breadth mean	Depth mean
Adhocracy	25	22.00 (9.10)	58.00	1.67	1.84	1.08
Clan	80	30.13 (13.48)	71.17	0	1.44	0.8
Market	34	23.99 (12.16)	64.17	0	1.00	0.59
Hierarchy	29	23.88 (10.48)	53.33	0	0.97	0.38

collaboration breadth and depth. Companies with a dominant hierarchy culture have the lowest levels of collaboration breadth and depth.

In order to establish if there is a significant difference between open and closed companies, an independent two means t-test is used with the two foresight groups – No Open Foresight (No OF) and Open Foresight (OF), and the four CVF cultures. To test the homogeneity of variances, Levene's (1960) test is used. The results are reported in Table 4 and Figure 2, and discussed in the next section.

Binary probit regression is conducted to test the hypotheses. H1 to H4 are confirmed if the relationships between culture and open foresight breadth and depth are significant with positive signs for the adhocracy, clan and market cultures, and a negative sign for the hierarchy culture. The regression results are presented in Table 5 and discussed in the next section.

Table 4. Cultural values of closed and open companies

	No Open Foresight (No OF) Mean (SD), $N = 106$	Open Foresight (OF) Mean (SD), N = 62	*t*-test
Adhocracy	19.70 (8.61)	25.91 (8.62)	$t(166) = -4.508$, $d = 0.73$, $p < 0.001$*
Clan	27.76 (13.05)	34.18 (13.32)	$t(166) = -3.051$, $d = 0.49$, $p < 0.003$*
Market	26.35 (12.83)	19.97 (9.76)	$t(166) = 3.381$, $d = 0.\ 54$, $p < 0.001$*
Hierarchy	26.19 (10.61)	19.94 (9.03)	$t(166) = 3.884$, $d = 0.71$, $p < 0.001$*
BREADTH	0	3.60 (1.76)	
DEPTH	0	1.97 (1.45)	

*$\alpha = 0.05$.

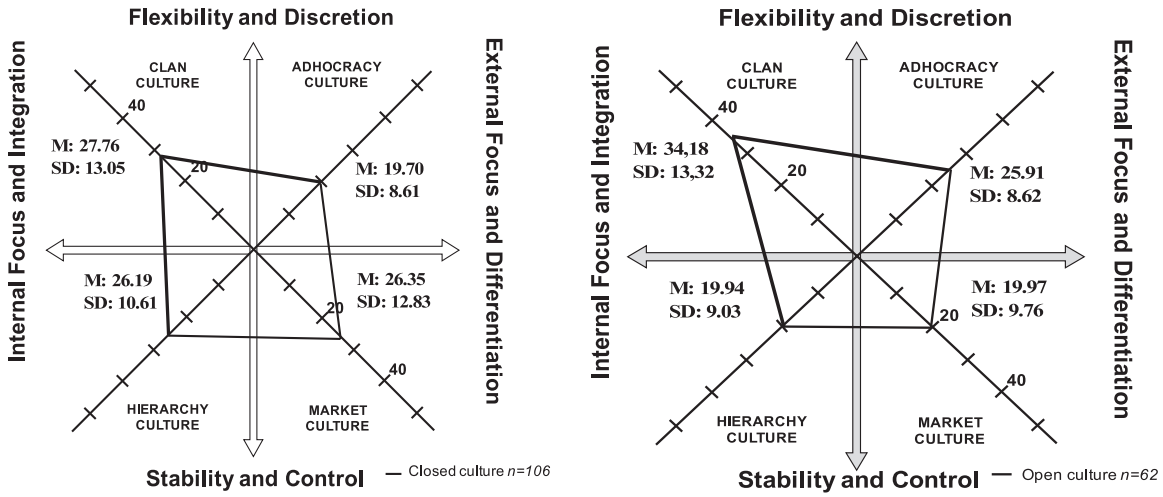

Figure 2. Closed culture versus open culture.

Table 5. Which culture fosters openness? Binary probit regression

	Marginal effect (SD) BREADTHCOLLAB, $N = 168$	Marginal effect (SD) DEPTHCOLLAB, $N = 168$
Adhocracy	0.01958*** (0.00465)	0.0190*** (0.00448)
Clan	0.00855*** (0.00288)	0.00622** (0.00275)
Market	−0.01159*** (0.00350)	−0.01027*** (0.00338)
Hierarchy	−0.01466*** (0.00391)	−0.01205*** (0.00373)

***$p < 0.01$.
**$p < 0.05$.

5. Results

5.1. Open versus closed to foresight

Table 4 shows that No OF and OF companies have different cultures. This difference is significant for all cultures. In closed companies, the mean values for the clan (27.76), market (26.35), and hierarchy (26.19) cultures are quite similar; the value for the adhocracy culture is notably lower (19.70). In companies that are open for open foresight, clan-type mean values (34.18) are dominant, followed by the adhocracy culture values (25.91). The values for the hierarchy (19.94) and market (19.97) cultures are nearly equal but much lower than the values for the other types.

5.2. Which culture fosters participation in open foresight?

Table 5 shows the marginal effects, i.e. the change in probability when the independent variable (culture) increases by one unit (Komlos and Süssmuth, 2010). The values for both breadth and depth are significant for all four culture types. The adhocracy and clan cultures have positive signs, and the relationship with open foresight is stronger for the adhocracy culture than it is for the clan culture. Hence, H1 and H2 are supported. As the signs for the market culture are negative, H3 is rejected. The signs for the hierarchy culture are negative, which confirms H4.

6. Discussion

Companies are increasingly interested in collaborating with other organizations to better master the complexity and dynamics of their business environments and to benefit from the potential of integrating external knowledge into their innovation and foresight processes. Inter-organizational collaboration requires that certain conditions are in place, in particular an open culture. The hypotheses tested in this paper are based on the Competing Values Framework and reports on the influence of organizational culture in adjacent areas, notably open innovation, collaboration, and knowledge sharing.

H1 and H2 predict a positive association between engagement in open foresight and strong adhocracy or clan values. The effects should be stronger for adhocracy than for clan cultures. Both hypotheses are confirmed. This goes against Klimas (2016), who found in her research on coopetition that the adhocracy culture is the least beneficial for openness, and Eckenhofer and Ershova (2011, p. 38), who suggest that the '*clan culture … supports the creation of solid* [intra-organizational] *networks the most*'. However, the findings confirm suggestions put forward in the open innovation literature (Chesbrough, 2003; Docherty, 2006; Laursen and Salter, 2006; Ollila and Elmquist, 2011; Naqshbandi et al. 2015). Organizations with strong adhocracy values are characterized by a dynamic, entrepreneurial, and creative work environment, risk-taking, and committed, experimental and innovative organizational members (Cameron and Quinn, 2006). The literature on open innovation shows that a culture that reflects these traits, i.e. encourages risk-taking, supports openness to new ideas, tolerates failure (Docherty, 2006; Herzog and Leker, 2010; Ollila and Elmquist, 2011) and features an entrepreneurial spirit (Bessant et al., 2010; Enkel et al., 2011), facilitates open innovation. Similarly, a culture that emphasizes teamwork, cooperation, employee involvement, engagement, and commitment, (Tsui et al., 2006; Szymańska, 2016; Eckenhofer and Ershova, 2011), which reflect the clan values of participation, loyalty and commitment, has also been reported to facilitate openness. Apparently, these values, which represent the flexibility dimension of the CVF framework, not only support open innovation but open foresight, too.

There are also culture values that inhibit participation in open foresight. Our findings support H4, namely that companies with strong hierarchy values are unlikely to engage in open foresight. This is in line with the findings of Eckenhofer and Ershova (2011), who conclude that the hierarchy culture provides the least support for openness, and Chesbrough (2003), who proposes that the internal and control orientation of the hierarchy culture hinder open innovation.

Going *against* H3, this is also true for companies characterized by strong market values, albeit to a lesser extent. Although this confirms Wiewiora et al.'s (2013) observation that a market culture hinders knowledge sharing, the finding is surprising, considering that the market culture is located in the external focus dimension of the CVF framework, which should support openness. Four, not necessarily competing, considerations may explain this finding.

First, the most obvious explanation is that the flexibility traits of organizational culture have a stronger effect on openness than the control traits. After all, the clan and adhocracy cultures have flexibility in common and favor open foresight, while the hierarchy and market cultures share a focus on control and hinder openness.

Second, the internal–external dimension in the CVF may need to be reinterpreted in the sense that external orientation does not equal openness. There is something to say for this explanation. The underlying values of the market culture are

results orientation, an emphasis on achievement and getting the job done, a focus on transactions with external parties, productivity, though and demanding leadership, and competition, winning, and success defined in terms of market share and penetration. None of these values actually point to openness; they rather suggest closed ranks, arms-length relationships with the market environment, geared toward fighting off any competition. The clan culture, in contrast, is characterized by traits that support collaboration, such as participation, teamwork, and involvement, which apparently do not only enhance *internal* collaboration but also help companies to seek collaboration across the borders of their organization. Together, the first two explanations imply that the flexibility/control and internal/external dimensions are not orthogonal.

A third explanation is that these two dimensions work as a continuum. In practice, very few companies should be found in the corners of Figure 1 and have a pure culture. The wide majority of companies have a mixed culture – we do not indeed find any 'pure' company in our sample, only companies with a *predominantly* adhocracy, clan, market, or hierarchy culture (Figure 2). If we take the clan culture as an example, this may imply that values in that internally oriented culture, which go *against* openness, are compensated for by openness-enhancing values 'borrowed' from the adhocracy culture. Further research is needed to shed light on these suggestions.

A final possible explanation might be that the market culture does emphasize openness, but is relatively weak on internal knowledge sharing and utilization (Wiewiora et al., 2013). In contrast, the clan culture fosters a collaborative environment as well as a noncompetitive working atmosphere, which support knowledge sharing (Wiewiora et al., 2013). In addition, previous work on open foresight (Wiener et al., 2018a) and, for that matter, open innovation argues that it is particularly important for a firm to have the competences not only to share but also to absorb and assimilate new knowledge ('absorptive capacity') (Dahlander and Gann, 2010; Enkel et al., 2011). Thus, lacking a strong absorptive capacity, a firm with a market culture will not benefit from open foresight and may stop engaging in open foresight, not because it is not open for collaboration, but due to unsatisfactory, or even lack of, outcomes.

7. Conclusion

7.1. Contribution

Little is known about the influence of culture on a company's openness to, and successful participation in, open foresight. This paper contributes to filling this gap and analyzes the associations between the culture types of the Competing Values Framework and openness to participation in open foresight. The clan and adhocracy cultures appear to provide the best circumstances for openness, whereas the market and hierarchy cultures inhibit openness.

With the exception of the unexpected negative impact of the market culture, these findings confirm the hypotheses formulated borrowing from previous research on open innovation and collaboration. Yet, at face value, they are somewhat surprising: the clan culture is internally oriented but supports engagement in open foresight, while the externally oriented market culture does not support open foresight. Four, not necessarily competing, explanations are put forward for further research.

The research should help companies predict, based on their organizational culture, whether they have the conditions in place to embark on an open foresight journey or need to ensure first that their organizational culture is conducive to such a venture.

7.2. Limitations and further research

Four suggestions were put forward to explain why the internally oriented clan culture does support open foresight, while the externally oriented market culture fails to do so. Further in-depth, preferably case-based, research is needed to shed light on these suggestions. In addition, future research might not only measure open foresight engagement based on the two variables breadth and depth (Laursen and Salter, 2006), but also question if previous open participation in foresight was considered beneficial (Wiener et al., 2018a).

Then, the sample used in this study is relatively small and limited to Austria. Further research using a larger sample including other countries should provide grounds for greater generalizability. Finally, the results, however insightful they are, focus on organizational culture. Further research should consider other factors, including top management commitment and involvement and the homogeneity/heterogeneity of the open foresight team (Wiener, 2018), which might have an impact on starting and conducting open foresight projects.

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